REPORT ON EXPERIMENT 3
Basics of Chemical Reactions

DATA AND RESULTS

	Observations	Equation
test 1: Burning Mg	bright white	$2Mg(s) + O_2(g) \rightarrow 2MgO(s)$
		$3Mg(s) + N_2(g) \rightarrow Mg_3N_2(s)$
test 2: $NH_3(g) + HCl(g)$	dense white smoke	$NH_3(g) + HCl(g) \rightarrow NH_4Cl(s)$
test 3: $CuCO_3(s) + HCl(aq)$	gas formation (bubble)	$CuCO_3(s) + 2HCl(aq) \rightarrow CuCl_2(aq) + H_2O(l) + CO_2(g)$
Net ionic equation		$CuCO_3(s) + 2H^+(aq) \rightarrow Cu(aq) + H_2O(l) + CO_2(g)$
test 4: Heating $CuCO_3(s)$	Black ppt CuO(s) gas formation	$CuCO_3(s) \xrightarrow{\Delta} CuO(s) + CO_2(g)$
test 5: $CuO(s) + HCl(aq)$	black solution, hot bottom	$CuO(s) + 2HCl(aq) \rightarrow CuCl_2(aq) + H_2O(l)$
Net ionic equation		$CuO(s) + 2H^+(aq) \rightarrow Cu^{2+}(aq) + H_2O(l)$
test 6: $Mg(s) + HCl(aq)$	gas formed, smell hot bottom,	$Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$
Net ionic equation		$Mg(s) + 2H^+(aq) \rightarrow Mg_{(aq)} + H_2(g)$
test 7:		
a. $AgNO_3(aq) + HCl(aq)$	white ppt HCl	$AgNO_3(aq) + HCl(aq) \rightarrow AgCl(s) + HNO_3(aq)$
Net ionic equation		$Ag(aq) + Cl(aq) \rightarrow AgCl(s)$
b. $Pb(NO_3)_2(aq) + HCl(aq)$	wht ppt PbCl	$Pb(NO_3)_2(aq) + 2HCl(aq) \rightarrow PbCl_2(s) + 2HNO_3(aq)$
Net ionic equation		$Pb(aq) + 2Cl(aq) \rightarrow PbCl_2(s)$
c. $Cu(NO_3)_2(aq) + HCl(aq)$		N.R.
Net ionic equation		$Cu^{2+}(aq) + 2NO_3(aq) + 2H^+(aq) + 2Cl(aq) \rightarrow Cu^{2+}(aq) + 2Cl(aq) + 2H^+(aq) + 2NO_3(aq)$
d. $Fe(NO_3)_3(aq) + HCl(aq)$	~~yellow~~ solution.	N.R.
Net ionic equation		$Fe^{3+}(aq) + 3NO_3(aq) + 3H^+(aq) + 3Cl(aq) \rightarrow Fe^{3+}(aq) + 3Cl(aq) + 3H^+(aq) + 3NO_3(aq)$
e. $Ba(NO_3)_2(aq) + HCl(aq)$		N.R.
Net ionic equation		$Ba^{2+}(aq) + 2NO_3(aq) + 2H^+(aq) + 2Cl(aq) \rightarrow Ba^{2+}(aq) + 2Cl(aq) + 2H^+(aq) + 2NO_3(aq)$
f. $KNO_3(aq) + HCl(aq)$		N.R.
Net ionic equation		$K^+(aq) + NO_3(aq) + H^+(aq) + Cl(aq) \rightarrow K^+(aq) + Cl(aq) + H^+(aq) + NO_3(aq)$
test 8:		
a. $AgNO_3(aq) + NaOH(aq)$	Brown ppt AgOH	$Ag(aq) + NaOH(aq) \rightarrow AgOH(s) + NaNO_3(aq)$
Net ionic equation		$Ag^+(aq) + OH^-(aq) \rightarrow AgOH(s)$
b. $Pb(NO_3)_2(aq) + NaOH(aq)$	wht ppt PbOH	$Pb(NO_3)_2(aq) + 3NaOH(aq) \rightarrow Pb(OH)_3(s) + 3NaNO_3(aq)$
Net ionic equation		$Pb^{3+}(aq) + 3OH^-(aq) \rightarrow Pb(OH)_3(s)$
c. $Cu(NO_3)_2(aq) + NaOH(aq)$	blue ppt CuOH	$Cu(NO_3)_2(aq) + 2NaOH(aq) \rightarrow Cu(OH)_2(s) + 2NaNO_3(aq)$
Net ionic equation		$Cu^{2+}(aq) + 2OH^-(aq) \rightarrow Cu(OH)_2(s)$

d. $Fe(NO_3)_3(aq) + NaOH(aq)$ — yellow ppt FeOH — $Fe(NO_3)_3(aq) + 3NaOH(aq) \rightarrow Fe(OH)_3(s) + 3NaNO_3(aq)$

Net ionic equation — $Fe^{3+}(aq) + 3OH^-(aq) \rightarrow Fe(OH)_3(s)$

e. $Ba(NO_3)_2(aq) + NaOH(aq)$ — wht ppt BaOH — $Ba(NO_3)_2(aq) + 2NaOH(aq) \rightarrow Ba(OH)_2(s) + 2NaNO_3(aq)$

Net ionic equation — $Ba^{2+}(aq) + 2OH^-(aq) \rightarrow Ba(OH)_2(s)$ — -5

f. $KNO_3(aq) + NaOH(aq)$ — N.R.

Net ionic equation — $K^+(aq) + NO_3^-(aq) + Na^+(aq) + OH^-(aq) \rightarrow K^+(aq) + OH^-(aq) + Na^+(aq) + NO_3^-(aq)$

test 9:

a. $AgNO_3(aq) + H_2SO_4(aq)$ — wht ppt — $2AgNO_3(aq) + H_2SO_4(aq) \rightarrow Ag_2SO_4(s) + 2HNO_3(aq)$

Net ionic equation — $2Ag(aq) + SO_4^{2-}(aq) \rightarrow Ag_2SO_4(s)$

b. $Pb(NO_3)_2(aq) + H_2SO_4(aq)$ — wht ppt $PbSO_4$ — $Pb(NO_3)_2(aq) + H_2SO_4(aq) \rightarrow PbSO_4(s) + 2HNO_3(aq)$

Net ionic equation — $Pb^{2+}(aq) + SO_4^{2-}(aq) \rightarrow PbSO_4(s)$

c. $Cu(NO_3)_2(aq) + H_2SO_4(aq)$ — N.R.

Net ionic equation — $Cu^{2+}(aq) + 2NO_3^-(aq) + 2H^+(aq) + SO_4^{2-}(aq) \rightarrow Cu^{2+}(aq) + SO_4^{2-}(aq) + 2H^+(aq) + 2NO_3^-(aq)$

d. $Fe(NO_3)_3(aq) + H_2SO_4(aq)$ — N.R.

Net ionic equation — $2Fe^{3+}(aq) + 6NO_3^-(aq) + 6H^+(aq) + 3SO_4^{2-}(aq) \rightarrow 2Fe^{3+}(aq) + 3SO_4^{2-}(aq) + 6H^+(aq) + 6NO_3^-(aq)$

e. $Ba(NO_3)_2(aq) + H_2SO_4(aq)$ — wht ppt $BaSO_4$ — $Ba(NO_3)_2(aq) + H_2SO_4(aq) \rightarrow BaSO_4(s) + 2HNO_3(aq)$

Net ionic equation — $Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(s)$

f. $KNO_3(aq) + H_2SO_4(aq)$ — N.R.

Net ionic equation — $2K^+(aq) + 2NO_3^-(aq) + 2H^+(aq) + SO_4^{2-}(aq) \rightarrow 2K^+(aq) + SO_4^{2-}(aq) + 2H^+(aq) + 2NO_3^-(aq)$

QUESTIONS

(Submit your answers on a separate sheet if necessary.)

1. Describe in detail a test to determine whether an unknown solution is:
   a. $AgNO_3$ or $Ba(NO_3)_2$
   b. $Ba(NO_3)_2$ or KNO_3
   c. $Pb(NO_3)_2$ or $Fe(NO_3)_3$
   d. $Fe(NO_3)_3$ or KNO_3
   e. HCl or H_2SO_4

2. In the reaction of $AgNO_3$ with NaOH, the precipitate obtained is Ag_2O and not AgOH. Write a balanced equation for this reaction.